S
628.05
W3b
Fall 1984
c.2

PLEASE RETURN

20 C

Big Sky Clearwater

FALL 1984

Water School Issue

STATE DOCUMENTS COLLECTION
AUG 2 7 1984
MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

Flathead Lake is Changing

SEE ARTICLE INSIDE

Montana State Library
3 0864 1006 7346 9

Annual School — Fifty-First

The water school will be held in Bozeman on September 24-27, 1984 at the Strand Union Building, Montana State University. Jointly sponsored by Montana State University and the Water Quality Bureau, Department of Health and Environmental Sciences, the program features lectures and discussions by experts in the field of water and wastewater treatment. In addition, Sessions for Operator Study (SOS) provide instruction and supervised practice in solving problems similar to those that arise on a day-to-day basis in water and wastewater operations. These sessions should also benefit those taking the certification exam. The following is a preliminary program for the water school. For further information please contact:

Jan Cranor or
Denise Osterman
Water Quality Bureau
Dept. of Health &
Environmental Sciences
Helena, MT 59620
444-2406

Dr. Howard S. Peavy
Department of Civil Engineering
Montana State University
Bozeman, MT 59717
994-2111

PRELIMINARY PROGRAM

FIFTY-FIRST ANNUAL SCHOOL FOR WATER AND WASTEWATER OPERATORS AND MANAGERS

MONDAY, SEPTEMBER 24 - Morning

7:30 a.m.	Registration (Room 276, Strand Union Building)
8:30 a.m.	Joint Session (Rooms 275 & 276)
	Welcome, Dave Gibson, Dean, College of Engineering
	Response and School Objectives, Jan Cranor, Denise Osterman
	Operator Certification - Why, Who, How, Rosemary Fossum
9:30 a.m.	Break
10:00 a.m.	Communications and Public Relations
11:45 a.m.	Lunch

Afternoon - Session 1, Water Operators (Room 275)

1:00 p.m.	Overview of Water Treatment
	Guided Tour and Lecture on Bozeman's New Water Treatment Plant
4:30 p.m.	Session for Operator Study (SOS)

Session 2, Wastewater Operators (Room 276)

1:00 p.m.	Overview of Wastewater Treatment
	Guided Tour and Lecture on Bozeman's Advanced Wastewater Treatment Plant
4:30 p.m.	Session for Operator Study (SOS)

TUESDAY, SEPTEMBER 25 - Morning

Session 1, Water Operators (Room 275)

8:00 a.m.	Water Treatment Operations
10:00 a.m.	Break

Session 2, Wastewater Operators (Room 276)

8:00 a.m.	Wastewater Treatment in Asia, Dr. Aziz (Visiting Professor at MSU)
9:00 a.m.	Wastewater Discharge and Stream Ecology
9:30 a.m.	Wastewater Treatment Plant Simulator
10:00 a.m.	Break

Joint Session (Rooms 275 & 276)

10:30 a.m.	Computer Usage in Water and Wastewater Treatment Plant Operations
12:00	Lunch Break

Afternoon

Session 1, Water Operators (Room 275)

1:00 p.m.	Wells
3:00 p.m.	Break

Session 2, Wastewater Operators (Room 276)

1:00 p.m.	The RBC System
3:00 p.m.	Break

Joint Session (Rooms 275 & 276)

3:30 p.m.	Coliform Analysis
4:30 p.m.	SOS

WEDNESDAY, SEPTEMBER 26 - Morning

Session 1, Water Operators (Room 275)

8:00 a.m.	Achieving Performance Goals in Water Treatment In Great Falls In Harlem In Helena Discussion, Moderator and Panel
10:00 a.m.	Break

Session 2, Wastewater Operators (Room 276)

8:00 a.m.	Control of Activated Sludge Conventional Activated Sludge Systems Extended Aeration Oxidation Ditch Discussion, Moderator and Panel
10:00 a.m.	Break

Joint Session (Rooms 275 & 276)

10:30 a.m.	Preventive Maintenance Programs
11:45 a.m.	Lunch

Afternoon

Joint Session (Rooms 275 & 276)

1:00 p.m.	Chlorination Chemistry and Applications
3:00 p.m.	Break
3:15 p.m.	Chlorine Safety
4:30 p.m.	SOS

THURSDAY, SEPTEMBER 27 - Morning

Session 1, Water Operators (Room 275)

8:00 a.m.	Water Distribution Systems
	Fluoridation of Water Supplies
10:00 a.m.	Break

Session 2, Wastewater Operators (Room 276)

8:00 a.m.	Lagoon Operation
9:00 a.m.	NPDES and Enforcement
10:00 a.m.	Break

Joint Session (Rooms 275 & 276)

10:30 a.m.	Trenching Safety
	Water and Wastewater Pumping
11:45 a.m.	Lunch

Afternoon

Joint Session (Rooms 275 & 276)

1:00 p.m.	Control Instrumentation
	Water Quality Problems on the Clark Fork
	Certificate Awards
3:00 p.m.	School is Out!

FRIDAY, SEPTEMBER 28

8:30 a.m.	Certification Exam (Rooms 275 & 276)

First MWPCA Award

to Armstrong

Ray Armstrong, former operator of the wastewater treatment plant in Bozeman, has received the first Montana Water Pollution Control Association award for outstanding performance.

Armstrong was nominated for the award during the 40th Annual Meeting of MWPCA in Great Falls on March 30.

The award cited Armstrong as follows: "In recognition of outstanding performance and professionalism in the operation of wastewater treatment plants and contributions to the dissemination of information concerning advancement in the field of wastewater treatment."

Armstrong graduated in 1974 from Montana State University with a degree in microbiology and went to work for the city of Bozeman. He returned to school part time and received a degree in civil engineering in June.

Armstrong trained and supervised one to two undergraduate students from MSU per quarter as an on-going program of the on-the-job training in wastewater treatment.

Armstrong has recently accepted an engineering position with HKM and Associates in Billings.

Examination Notice

ON FRIDAY--------------------SEPTEMBER 28, 1984-------------8:30 A.M. TO 12:30 P.M.
IN ROOM 276, STRAND STUDENT UNION BUILDING, MSU CAMPUS, BOZEMAN, MONTANA

examinations for certification as a Water Distribution Operator, Water Plant Operator, and Wastewater Plant Operator will be administered.

The examinations will be given at the conclusion of the annual Water School to be held on the MSU campus September 24-27. Attendance at the school is not required in order to take a certification examination. However, anyone planning to take an examination should complete a certification application AND examination registration slip before September 14, 1984, and send it to:

WATER/WASTEWATER OPERATOR CERTIFICATION
Water Quality Bureau - Room A206 - Cogswell Building
Helena, Montana 59620 - Phone: 444-2691

Annual fees for fiscal year 84/85 payable with application are:

Class 1 - $27; Class 2 - $22; Class 3 - $17; Class 4 - $12; Class 5 - $10

Those who have previously submitted certification applications and fees for fiscal year 84/85 will only need to submit Examination Registration Slips (detachable below) with a fee of $5 per examination. PLEASE RETAIN THE UPPER PORTION OF THIS NOTICE to know the time and place of the examinations. Checks should be made payable to: DHES - Operator Certification. For application materials or information contact the address or phone listed above.

EXAMINATION REGISTRATION SLIP
(Detach and return with $5 per examination by 9/14/84)

I will take the examination(s) I have checked below:

Type		Class: 1	2	3	4	5
Water Distribution	(A)	____	____	*____	*____	____
Water Plant or Well	(B)	____	____	____	*____	____
Wastewater	(C)	____	____	____	____	____

OR: I have applied for certification but I will not be able to take my examination on September 28 because ______________________________
____

NAME: ______________________ ADDRESS: ______________________

*Note: Those taking 3A and 4B or 4A and 4B will take a combination exam and remit $5 only.

Changes in Certification Program

The law governing operator certification (37-42-101 through 37-42-322 MCA) was reviewed by the last legislative session and some changes were made in the law.

1. The Board of Water and Wastewater Operators became the Water and Wastewater Operators Advisory Council whose function is to advise and assist the Department of Health and Environmental Sciences (department) in the administration of the certification program. The council's function as a board was considered very hazy by the legislative audit committee charged with reviewing the certification law since it was neither regulatory nor advisory.

2. The fee schedule was deleted from the law. Instead, the department adopts a fee schedule according to the costs of the program. Since the costs of the certification program were exceeding the fees, the department found it necessary to increase the fee schedule January 1, 1984. There is now a fee of $5.00 per examination and a late fee for those paying renewal fees after June 30, the end of the fiscal year.

3. The department may establish reasonable continuing education requirements for certified operators. Requirements are not yet in place but the advisory council is cooperating with the Montana Section of the American Water Works Association and the Montana Water Pollution Control Association to propose continuing education requirements for Montana operators in the future, possibly as early as 1986.

4. Operators or employers are now required to notify the department within three business days after termination if a certified water or wastewater operator terminates employment.

Operators who terminate employment may retain their certificate for two years providing their renewal fees are paid annually by June 30. After two years those still wishing to retain certification must complete new applications which will be reviewed by the department. The is not new to the law but may be new to you.

Job Announcement

An Environmental Specialist III (G. 14) position is available in the Montana Department of Health and Environmental Sciences, Environmental Sciences Division, Water Quality Bureau, Construction Grants Program. This position is responsible for reviewing many aspects of the planning, design, construction and operation of wastewater treatment facilities; reviewing and writing environmental assessments; project tracking; Big Sky Clearwater editing; program information gathering and data inputting. The position requires a Bachelor's Degree in a physical or life science or engineering and three years of experience in wastewater treatment and disposal at a mechanical plant or the EPA construction grants program. Applicants must possess the ability to communicate effectively both verbally and in writing. Statewide travel is required. Evaluation of qualifications may include a training and experience evaluation combined with an oral interview to determine specific knowledges, skills and abilities. Apply through local Job Service offices by September 4, 1984. Transcripts must be submitted with your application. Form PD 25B, DD 214, for proof of Veteran's Preference, and letter of eligibility from SRS for disabled preference must also be submitted to Job Service by deadline date. Salary $19,204 to $26,616. (Employees new to State Government will normally begin at the $19,204 salary.)

Flathead Phosphorus Strategy

By Loren Bahls, Ph.D.
Water Quality Bureau

Bodies of water, like people, age. The process of aging is unstoppable and irreversible. Flathead Lake is no exception. It is getting older and changing.

Flathead Lake is the largest natural freshwater lake in the western United States. It supports a large recreational industry and serves as an important local water supply.

Last summer there was an unprecedented bloom of algae across the length and breadth of Flathead Lake. Dr. Jack Stanford, director of the UM Biological Station on the lake, reported "intense bloom conditions...which included large standing crops of several species of algae not previously reported in Flathead Lake." Among those species was the pollution indicator and potentially toxic algae Anabaena flos-aquae, which reached an alarming 24 percent of the total standing crop.

To Stanford and others who have been following the fortunes of Flathead Lake over the years, this was a clear sign that the condition of the lake was deteriorating and that something had to be done.

One way scientists judge how old a lake is and how fast it is aging is to measure how much algae it produces from year to year. By this yardstick, Flathead Lake is leaving youth for middle age and it is aging rapidly. Although the aging of Flathead Lake cannot be stopped, a concerted effort can slow the process, improve the condition and lengthen the lifespan of the lake.

One of the many projects completed under the Flathead Basin Environmental Impact Study was a study of the limnology of Flathead Lake, including factors controlling algae production in the lake.* The study report established, without a doubt, that phosphorus was the element responsible for recent algae blooms and water quality degradation.

Besides precipitation and dust deposited directly on the lake, the main sources of phosphorus in Flathead Lake are domestic and municipal wastewater, including household detergents, and particles of soil eroded from the land. The amount of phosphorus entering Flathead Lake each year has increased because of the increase in the number of people living in the basin and in the area of land surface that has been disturbed and cleared of its protective vegetation.

To control aging is to control algae; to control algae is to control phosphorus; and to control phosphorus is to treat wastewater and control erosion.

As a blueprint for controlling phosphorus input to Flathead Lake, the Water Quality Bureau prepared and issued in April of this year a "Strategy for Limiting Phosphorus in Flathead Lake." This report reviews phosphorus impacts on the lake, identifies the major sources of phosphorus in the lake, summarizes phosphorus control alternatives, and recommends six steps that government agencies, local communities and concerned people can take to reduce the amount of phosphorus entering the lake.

Briefly, the six steps are: 1) Impose a 1.0 mg/l effluent limit for phosphorus on all MPDES discharge permits in the Flathead Basin; 2) Expand the water quality monitoring and evaluation program; 3) Recommend legislation to require the sale of only low or phosphorus-free detergents (except dishwashing detergents) in the area; 4) Implement a local nonpoint source program to control phosphorus export from forest activities, agricultural practices, land development and urban runoff; 5) Require subdividers to perform phosphorus adsorption tests on

---

*Stanford, J.A., T.J. Stuart and B.K. Ellis. 1983. Limnology of Flathead Lake: Final Report. University of Montana Biological Station, Bigfork.

soils where drainfields will be placed within 1/2 mile of any surface water; and 6) Develop a management plan for non-sewered communities in the Flathead Basin.

The Bureau's strategy was unveiled at a public meeting in Kalispell on May 14, 1984. About 200 people attended the meeting and all of those who rose to speak were in support of taking steps to protect Flathead Lake. The most serious reservation expressed by those who spoke was whether the steps suggested by the Bureau would give the lake enough protection.

Beginning with the community of Bigfork, the Bureau is now in the process of modifying discharge permits for municipalities in the basin to include the 1.0 mg/l effluent limit for phosphorus. Permittees will be required to submit compliance schedules based on anticipated completion of advanced wastewater treatment (phosphorus removal) facilities.

The UM Biological Station at Yellow Bay has received a two-year, $100,000 grant to continue and expand phosphorus research. The Bureau continues to evaluate mining, timber harvest and other development plans in the basin for their impact on water quality. And the Bureau has adopted the policy that if phosphorus adsorption capacity of septic tank drainfields does not exceed 50 years, then advanced ("tertiary") treatment must be provided. In support of this policy, the Bureau soon will issue guidelines for sanitarians and subdividers on how to calculate the phosphorus adsorption capacity and lifespan of septic tank drainfields.

The remaining tasks in the phosphorus control strategy will require concerted action at the local level. These include controls on the sale of phosphorus detergents, establishing a local nonpoint source pollution control program, and preparing management plans for non-sewered communities.

The Flathead Drainage 208 Program was set up initially to accomplish objectives such as these. Indeed, the program at one time sponsored State legislation to control phosphorus detergents and coordinated nonpoint source control activities in the basin. Unfortunately, the Flathead 208 Board is inactive and it has no staff. However, the new Flathead Basin Commission, authorized by the 1983 Legislature, may be the vehicle and catalyst to accomplish at least some of the phosphorus-control goals that require local initiative.

A limited number of the Bureau's "Strategy for Limiting Phosphorus in Flathead Lake" are available on request.

Editor Resigns

Bear with us! Once again the responsibility of publishing the Big Sky Clearwater (BSC) is in the hands of rookies. The previous editor and driving force behind this publication, Tim Hunter, has resigned his position at the Department of Health and Environmental Sciences and taken a job with the city of Hamilton. No one, to date, has been hired to replace Tim, therefore the BSC is in a transition mode.

Our organization may be shaky and our artwork may be rough but we pledge to keep the publication coming. However, we could use help. Send any ideas, articles, pictures or bits-of-interest to the following address so that we can enhance the publication and keep it full of interesting articles from Montana operators, engineers, etc. The articles need not be written in final form, we can help in that respect.

Send to: Big Sky Clearwater
MDHES/WQB
Cogswell Building
Helena, MT 59620

P.S.: Good luck to Tim in Hamilton. He has done an outstanding job with the BSC the last 3-4 years.

Understanding Chemical Testing

By Jim Melstad
Water Quality Bureau

Public Water Supplies

As you probably know, the State Department of Health and Environmental Sciences periodically requires sampling of public water supplies for various chemical tests. Depending on the type of supply, the chemical tests that are required vary. Basically, the chemical tests that are required are as follows:

1. Non-Community Public Supplies (bars, restaurants, campgrounds, etc.): One sample every 5 years for nitrates. Cost is $10.00 - $15.00.

2. Community Public Supplies (cities, towns, subdivisions, trailer courts etc.):

   (a) Groundwater supplies: One sample every 3 years for calcium, alkalinity, pH, sodium, bicarbonate, nitrate, fluoride, arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver. Cost is $100.00 - $150.00. See also (c) below.

   (b) Surface Water Supplies (includes groundwater supplies with auxiliary surface water sources): One sample <u>every</u> year is analyzed for the same chemicals listed in (a) above. In addition, one sample is analyzed every <u>three</u> years for pesticide and herbicide content. This cost is about $250.00. See also (c) below.

   (c) <u>All</u> community public supplies that add chlorine to the water and that serve more than 10,000 people must sample every three months for trihalomethane content. Cost is $90.00 to $260.00 per quarter, depending on the number of samples required.

   <u>All</u> community public supplies must sample every four years for radiological content. Depending on the type and amount of radiological content, costs vary from $20.00 - $120.00.

Any of the above tests may have to be taken at more frequent intervals if the maximum contaminant levels (MCL's) are approached or exceeded. MCL's are the maximum permissible levels in public water supplies as established in 1977 by the National Interim Primary Drinking Water Regulations (NIPDWR) and Montana's Public Water Supply regulations adopted in 1978 (revised 3/31/82). (Montana's regulations are modeled after the NIPDWR. Following adoption of the Montana regulations in 1978, the Montana Department of Health and Environmental Sciences was given the authority for enforcement of the Safe Drinking Water Act.)

But what do these tests mean? Why are they required?

DHES requires these chemical tests for health related reasons, of course. The MCL's were established primarily to prevent negative health effects from long-term (chronic) consumption of these contaminants in water. Short-term (acute) health effects are possible if a contaminant greatly exceeds the MCL.

Following is a list of the MCL's for each contaminant in the regulations and the potential health effects associated with each. A few definitions are needed before we start.

Definitions:

milligrams per liter (mg/l) - essentially the same as parts per million (ppm).

micrograms per liter (ug/l) - a milligram per liter divided by 1000. Also the same as parts per billion (ppb).

maximum contaminant level (MCL) - the level of a particular contaminant below which no health effects are likely. MCL's in water were established in an attempt to keep the total daily consumption of each contaminant from all sources (food, water, etc.) below a harmful amount. Average total daily water intake is assumed to be two liters per person.

chronic health effects - health effects which may occur from long-term consumption of a particular contaminant.

acute health effects - health effects which may occur from short-term consumption of a very high level of a contaminant. One dose may even produce acute effects at very high levels.

carcinogenic - a contaminant that is capable of producing cancer, at least in experimental situations.

toxic - poisonous; produces harmful effects by chemical action.

Contaminants:

1.) Arsenic - MCL is 0.05 mg/l. Toxic and possibly carcinogenic. Found naturally in water, grain, vegetables, meat and especially seafood. Arsenic contamination may result from pesticide application, mining and smelting as well as from natural sources. Mild chronic effects include fatigue and loss of energy. Acute and severe chronic effects include skin disorders, nerve disorders and kidney, liver and heart ailments. The body slowly excretes arsenic but excessive dosages will accumulate in the tissues of the body.

2.) Barium - MCL is 1.0 mg/l. Toxic. Capable of impairing nerve function, including the nerves controlling the heart. Small to moderate amounts can increase the blood pressure. Naturally occurring as well as occurring in man-made compounds such as rat poison.

3.) Cadmium - MCL is 0.01 mg/l. Toxic. Chronic effects include impaired kidney function evidenced by excessive protein in the urine. Anemia can also be produced and retarded growth may occur at higher chronic exposures. Cadmium contamination is usually man-made, such as from metal plating wastes. (Cigarettes contain cadmium also.)

4.) Chromium - MCL is 0.05 mg/l. Toxic. Can cause skin irritation through contact with contaminated water. Can also cause impaired function of the intestinal tract. Contamination sources are primarily man-made.

5.) Fluoride - MCL is 2.4 mg/l. Toxic in very high amounts but beneficial to the teeth at levels about 1.0 mg/l. Chronic exposure to levels above 2.4 mg/l can cause staining (mottling) of the teeth. Chronic

exposure to very high amounts over very long periods can cause bone change and even resultant crippling. Acute effects from exposure to extremely high doses include vomiting, stomach cramps, weakness, diarrhea and convulsions. Naturally occurring and commonly added in small amounts to public water supplies to strengthen the teeth of children.

6.) Lead - MCL is 0.05 mg/l. Toxic. Chronic exposure can produce impaired brain function and development in children. Also can produce kidney disease. Well documented, serious hazard to children. Acute effects from high dosages include fatigue, anemia, paralysis and impaired brain and digestive functions. Common sources of contamination are man-made. Lead based paint and automobile exhaust are common environmental sources.

7.) Mercury - MCL is 0.002 mg/l. Toxic. Chronic effects include nervous disorders, dizziness and reduced perception. Shaking of the hands occurs in more severe cases followed by restlessness and emotional distress in extreme cases. Acute effects include muscle tremors (shaking) and psychic disturbances. Contamination is primarily man-made.

8.) Nitrate - MCL is 10.0 mg/l. Can produce toxic effects in infants less than 6 months of age. (Can produce impaired transfer of oxygen to the blood). Not considered a health hazard for humans over six months of age. Disorder in infants is termed methemoglobinemia, or "blue babies". Source of contamination are both natural and man-made (fertilizer, human and animal wastes).

9.) Selenium - MCL is 0.01 mg/l. Toxic. Can produce loss of hair, weakened nails, and listlessness from chronic exposure. Commonly found in many foods and even considered as a possible essential nutrient at very low levels. Usually naturally occurring when found in water.

10.) Silver - MCL is 0.05 mg/l. Toxic. Chronic exposure can lead to skin discoloration. Not a very commonly found contaminant. Likely contamination sources are man-made.

11.) Insecticides and herbicides - MCL's are 0.0002 mg/l for endrin, 0.004 mg/l for lindane, 0.1 mg/l for methoxychlor, 0.005 mg/l for toxaphene, 0.1 mg/l for 2,4-D and 0.01 mg/l for 2,4,5-TP (silvex). Toxic and possibly carcinogenic. The insecticides (endrin, lindane, methoxychlor and toxaphene) produce similar symptoms in man. Acute effects include headache, nausea, digestive disturbances, numbness and weakness in the extremities, apprehension and irritability. Severe cases may produce strong muscular spasms that may lead to convulsions and cardiac or respiratory arrest. Chronic consumption can also produce liver and kidney disorders among others. The herbicides (2,4-D and 2,4,5-TP) produce effects similar to the insecticides. Contamination of water supplies by these chemicals is usually due to careless handling and application.

12.) Radiological Content - MCL is 15 picocuries per liter (same as 21 ug/l) for total alpha particles less uranium and 5 picocuries per liter (same as 7 ug/l) for alpha particles from radium only. Toxic and carcinogenic. Alpha particles are emitted from many radioactive substances. They are of concern because of their large size in relation to other atomic particles. Some substances, like radium, are more dangerous emitters than other radioactive substances. Chronic effects include damage to internal organs and bones. Leukemia may result from exposure and accumulation in the bones. Genetic damage may even occur, but may not show up until generations later. Acute effects from massive doses of radiation are well known and can even be fatal. Most alpha radiation contamination results from natural sources.

13.) Trihalomethanes - MCL is 100 ug/l for total trihalomethanes. Toxic and possibly carcinogenic. Trihalomethanes result from the use of chlorine, bromine and/or iodine to disinfect water. These disinfectants can react with excessive organic material to produce trihalomethanes. Because chlorine is most commonly used as a disinfectant, the resulting trihalomethane by-product is most commonly chloroform. Chronic effects of ingestion of chloroform include liver and kidney damage (including potential cancer development). Acute effects from ingestion in water would be extremely rare. Contamination in water would be man-caused.

14.) Sodium - There is only a recommended limit of 20 mg/l. Sodium can cause elevated blood pressure and liver damage. It is normally of concern only for people on low sodium diets because of pre-existing blood pressure, heart or liver problems. County health officers are advised when public water supply levels exceed 20 mg/l. Sodium occurs naturally and is difficult to remove from water.

15.) Calcium, alkalinity and pH - There is no MCL for these measurements. They are measured because certain combinations of these may produce corrosive conditions or scaling conditions. Generally speaking, low levels of these tend to produce corrosive conditions; high levels tend to produce scaling conditions.

In the next Clearwater issue, testing of water for aesthetic quality such as hardness, unusual tastes and odors and staining will be discussed.

Certification Clarification

Certification Fees

Annual certification in Montana runs from July 1 through June 30. The annual fee for renewal is paid in advance and must be received by July 1 to avoid a late penalty fee. Application fees for new operators are the same as the annual fee for each class. Renewal by June 30 is required regardless of the original date of application.

Examination Fees

A one-time examination fee of $5.00 is now required for each examination taken (except 3A/4B or 4A/4B combination exams). The examination fee is assessed each time a failed examination is re-taken.

Examinations

An operator with one type of certification (Water Distribution, Water Plant or Wastewater Plant) may request certification in another type by submitting a new application, an examination registration slip and the appropriate fee. If the new certification is the same class or lower as your existing certification, only the examination fee is necessary. If the new certification is in a higher class, an additional fee of the difference between the two classes will be required along with the examination fee. The annual certification fee is based on the highest certification class held.

An operator failing the fall exam will not be required to pay the annual fee again if the examination is re-taken the next spring. Only a new examination fee will be required when re-testing within the same certification year.

Any questions, Contact Rosie Fossum at the Operator's Certification Office 444-2406.

The certification office would appreciate your help in keeping your records and address current. For information, or to make address changes, call 444-2691 or write Water Quality Bureau--Operator Certification; Cogswell Building; Room A206; Helena, MT 59620

Clark Fork Monitoring

By Loren Bahls, Ph.D.
Water Quality Bureau

The largest water quality monitoring project ever conducted by the Water Quality Bureau of the Montana Department of Health and Environmental Sciences (DHES) was begun in March of 1984 on the lower Clark Fork River. The quarter-million dollar, two-year effort will attempt to determine whether contaminants from various wastewater sources along the river are affecting beneficial uses of the river and its water.

The project was prompted by a groundswell of public concern over the condition of the river and by a shortage of water quality data with which to make management decisions.

Beginning at Turah above Milltown Reservoir and extending for 225 miles downstream to below Cabinet Gorge Dam in Idaho, the monitoring network includes 31 fixed water quality stations on the river, its four mainstem reservoirs and three major tributaries--the Blackfoot, Bitterroot and Flathead rivers. The Bureau also will monitor conditions in a number of deep pools and slowwater areas between the Champion paper mill at Frenchtown and Thompson Falls Reservoir at Thompson Falls. Sampling will be done monthly and more frequently during the spring high water season.

A variety of chemical, physical and biological water quality variables will be measured in several hundred samples collected from both shallow waters and from the bottoms of deepwater pools and reservoirs. In addition to the scheduled sampling, field personnel will look for and record any incidental evidence of water quality degredation.

The two largest dischargers to the lower Clark Fork River--the City of Missoula Wastewater Treatment Plant and the Champion International Paper Mill at Frenchtown--have been asked to expand their self-monitoring programs to provide data needed by the state to assess water quality impacts. Much of the recent concern over the river's health stems from a controversial decision by the DHES to issue a modified discharge permit to the Champion Mill. The modified permit, issued in early April of this year, allows Champion to increase its yearly load of suspended solids to the river and to discharge year-round, but only when flows in the river exceed 1900 cfs. (Before, Champion could not discharge below a river flow of 4000 cfs, which limited discharges to a brief period in the spring.)

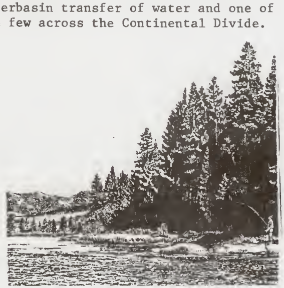
Nutrients, heavy metals and suspended solids, especially organic solids, will be scrutinized very closely. Champion and the City of Missoula are the two largest sources of nitrogen and phosphorus, which may be stimulating undesirable algal growth in downstream reservoirs and in Lake Pend Oreille in Idaho. The heavy metals originate far upstream in the Butte mining district, but there is evidence they have been dispersed throughout the floodplain downriver to Milltown Dam, and perhaps even below that point. There is concern that respiration of the organic solids released by Missoula and Champion may cause deficits in dissolved oxygen downstream, and also lower the pH of bottom waters, which may in turn mobilize metals and make them more toxic to fish and aquatic life.

Joining the Bureau in studies on the lower Clark Fork River during the next two years will be the Montana Department of Fish, Wildlife and Parks, the State of Idaho Division of Environment, the U.S. Geological Survey, Champion International, and researchers from the University of Montana. Relevant data from the various studies will be used by the Bureau to write an environmental impact statement prior to consideration of the reissuance of the Champion discharge permit in April of 1986.

Champion also will be investigating various alternatives to its present use of rapid-infiltration ponds for wastewater disposal. The ponds, which worked well for several years, are becoming plugged. This plugging resulted in a greater reliance on direct discharge of treated wastewater, hence the need for a modified discharge permit.

Meanwhile, a large number of studies are underway on Silver Bow Creek and the upper Clark Fork River, many of them associated with the Silver Bow Creek Superfund project. The Bureau also monitors water quality at seven stations on these two streams, which are perhaps the most abused and studied waters in Montana. All of the Clark Fork River studies in Montana are being coordinated by a position in the Governor's Office which has been funded in part by a grant from the Anaconda Minerals Company. Other sources of funding for Clark Fork studies include the Environmental Protection Agency, the Montana Water Resources Research Center, Champion International, and State General Funds for water pollution control.

To put the Bureau's Clark Fork monitoring in perspective, Bureau field crews will collect and carry on the average over the next two years, one gallon per day of Clark Fork River water over McDonald Pass to the Department Chemistry Lab in Helena. Not only will this be one of the largest water quality monitoring projects in state history, it will also amount to a significant interbasin transfer of water and one of the few across the Continental Divide.



Attention

Wastewater Operators

DO YOU NEED MORE INFORMATION ON EXTENDED AERATION, ANAEROBIC DIGESTERS, COLLECTION SYSTEMS, ACTIVATED SLUDGE PROCESS CONTROL?

OR

IF YOUR THING IS WATER TREATMENT, COULD YOU USE SOME INSIGHTS INTO HYDRAULICS OR WATER CHEMISTRY?

IF SO, WE HAVE WHAT YOU NEED! Contact your Water Quality Technology Training Resource Library.

The Water Quality Technology Training Resource Library, located in the Math-Science building at Northern Montana College has been in operation since January. The library was established with funds from an EPA 104(g)(1) Manpower Development Grant. Many requests for materials have already been filled. The books and audio visual materials are available for free loan. The only charge is for postage.

New acquisitions to the library include computer programs for Apple equipment and great new books and materials. Supplemental library funding from the Montana Environmental Training Coordinating Organization (METCO) allowed the library to increase its inventory. METCO is now based at Northern Montana College in Havre. Future plans for the resource library include development of correspondence courses for continuing education. A catalog addendum will be coming out in early fall. The purpose of the library is to serve the needs of operators in Montana so.....pull out your catalog and order a book, a slide/tape set or a training workbook.

WHAT?? You don't have a catalog??

HEY! This is good stuff!

If you need a catalog or more information write:

Water Quality Technology Training
Resource Library
Science Department
Northern Montana College
Havre, MT 59501

or call 265-7821 Ext 3257

Determine Dosages Through Jar Tests

By Denise Osterman
Water Quality Bureau

The goal of all water treatment plant operators should be to produce the highest quality of finished water possible. All operators treating surface water need to chemically treat and filter it in order to consistently produce a low turbidity product (0.1 - 0.3 NTU). Simply stated, chemical pre-treatment is the method used to neutralize the negative charge on turbidity particles, better known as the coagulation process. With proper coagulation, the turbidity particles going onto a filter will have no charge and this is the single most important reason that the water is able to be filtered.

Now, how do you decide what the proper chemical pre-treatment will be in order to achieve effective coagulation? Laboratory and in-plant control are a large part of the answer. The basic reason lab and in-plant control are essential to proper coagulation, is because most plants treating surface water are subject to wide variations in quality.

The type and frequency of tests required depend largely on the characteristics of the raw water and on the plant design. Preferably, laboratory investigations of treatment should begin before the plant is designed and constructed. This will allow the plant to be specifically designed to handle a particular raw water.

Although each water plant will require its own specialized combination of tests and test methods, one laboratory test that all plants treating surface water should be performing is the JAR TEST. The jar test attempts to simulate the full-scale coagulation-flocculation process and has been the most commonly used laboratory test for determining dosage since its introduction in 1918. The test has not been standardized due to the fact that its intent is to simulate an individual plant's conditions. However, even though this test is variously performed, it does have some elements of conformity. A suggested procedure is outlined below:

1

Equipment needed includes the following:

- jar-test stirrer, 6 paddles (it should be a variable-speed model)
- illuminated stand (preferable but not essential)
- 6, 1500-ml beakers
- some 1- and 5-ml pipettes
- 6, 250-ml Erlenmeyer flasks
- 1, 1000-ml graduated cylinder (plastic)
- 12 to 18 small test tubes
- a wide-tipped 25-ml pipette or plastic meat baster
- balance
- large bucket
- filter set-up, including filter flask, filter paper and vacuum pump

2

Prepare standard (stock) solutions of each chemical to be used in the jar test. Normally alum is made up as a 1% solution (10 grams added to 1000 mls treated water = 1% solution). Now 1 ml of this 1% solution added to 1000 mls of raw water sample would be equivalent to adding a dosage of 10 ppm (mg/l). For example, if you want to have a final dosage in a jar of 20 ppm, then you would add 2 mls of 1% stock solution to the jar. Since lower dosages of polymers are generally

required, the polymer stock solution is made up of a .01% solution (0.1 gram added to 1000 mls treated water = .01% solution). Now 1 ml of this solution added to 1000 mls of raw water sample is equivalent to adding a dosage of 0.1 ppm (mg/l). Therefore, if you want a final dosage of 0.5 ppm in one of the jars, you would add 5 mls of the .01% stock solution to that jar.

Remember that the above is only a suggested guideline for making up stock solutions. You may need to vary from these depending on the average amount of chemical dosages required at your plant. In general, alum stock solutions can be kept for up to a week but polymer solutions should be made up daily.

3 Collect a fresh sample of raw water in a large bucket. Measure the turbidity, pH, temperature and any other parameters you will be testing for after treatment. Add one liter (1000 mls) to each of the six 1500-ml beakers.

4 All six jars should be dosed simultaneously during the rapid-mix stage. The best way to do this is to add the stock solution to the test tubes first, increasing the dosage from left to right (for example, with alum start with 5 ppm, 10 ppm...ending with 30 ppm) so that the first jar is likely to represent undertreatment and the last jar overtreatment. Since the dosages to be added to each jar are pre-measured, they can be added two at a time in quick succession or you can tape the test tubes onto a strip of wood, allowing them to be dumped simultaneously. Add different chemicals in the same order of addition that you do in your actual plant.

5 Rapid mix at a RPM and time that is reasonably representative of your actual plant rapid-mix conditions (I usually end up flash mixing for 20-30 seconds at 80-100 rpm.)

With direct filtration plants, omit steps 6 and 7, going directly to step 8.

6 Taper the stirring down until a very slow speed is reached. Again try to simulate plant conditions. Observe and record floc formation. Note the beaker(s) in which floc formation is most rapid, strong, or well-defined.

7 Settle to match plant retention time.

8 Carefully withdraw the supernatant using a large pipette and bulb or a meat baster and deliver to 250-ml Erlenmeyer flasks for use in the next step.

9 Filter the supernatant (I use Whatman filter paper with pores large enough for the raw water to go through) and test for turbidity, pH, residual aluminum, etc.

It may be necessary to run several sets of tests varying chemical combinations and dosages, but make certain that only one variable is changed at a time in a given beaker. My experience has shown that the benefits of laboratory testing largely outweigh any inconveniences encountered in the lab when your goal is to economically produce the best quality water possible. If you would like assistance with jar testing or if you have any questions about the above information, please feel free to call me at the Water Quality Bureau (444-2406).

Operator Certification Corner

1. A grab sample represents:

A. The average daily condition at the sampling location.
B. The condition of the system two hours before and after the sample was taken.
C. The condition of the system when the sample was taken.
D. None of the above.

2. A 24-hour composite sample best representative of plant flow would be:

A. One sample of equal volume every 24 hours.
B. Equal volume samples every 10 minutes for 24 hours.
C. Two flow proportioned samples at peak and low flows in a 24-hour period.
D. Flow proportioned samples at 1 hour intervals for 24 hours.

3. Chlorine is:

A. Lighter than air
B. Heavier than air.
C. The same weight as air.

4. To find the location of a chlorine leak you should:

A. Spray the entire area with an industrial strength ammonia solution and watch for a white cloud.
B. Spray the entire are with a soap solution and watch for bubbles.
C. Pass an ammonia soaked rag under the suspected leak area and watch for a white cloud.
D. Shine a light on the suspected area and watch for a stream of green gas.

5. The most important thing to wear when locating a chlorine leak or changing a cylinder is:

A. A raincoat.
B. Waterproof boots.
C. A self-contained breathing apparatus.
D. Goggles.
E. Gloves.

6. A purpose of a well screen is to exclude sand and still allow maximum water flow. The most important feature is:

A. The position of the screen in the well.
B. The material from which it is made.
C. The size of the openings.
D. The total surface area.

Answers

1. C
2. D
3. B
4. C
5. C
6. C

The Big Sky Clearwater--for water and wastewater-treatment operators across Montana--is published two times a year by the Water Quality Bureau of the State Department of Health and Environmental Sciences in cooperation with the Montana Section American Water Works Association and the Montana Water Pollution Control Association.

Publication dates: March 1 and August 1. Last date to receive contributions is 21 days before publication. Mail contributed material to Water Quality Bureau, Department of Health and Environmental Sciences, Room A206, Cogswell Building, Helena, Montana 59620

Water Quality Bureau
Department of Health
& Environmental Sciences
Room A206, Cogswell Bldg.
Helena, MT 59620

TO:

1,850 copies of this public document were published at an estimated cost of 52¢ per copy, for a total cost of $962.00, which includes $769.50 for printing and $192.50 for distribution.